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COMMITTEE ON THE PEACEFUL USES OF
OUTER SPACE
Scientific and Technical Subcommittee
Forty-third session
Vienna, 20 February - 3 March 2006
Agenda item 9
Use of Nuclear Power Sources in Outer Space

JOINT UNITED NATIONS/INTERNATIONAL ATOMIC ENERGY AGENCY TECHNICAL WORKSHOP ON THE OBJECTIVES, SCOPE AND GENERAL ATTRIBUTES OF A POTENTIAL TECHNICAL SAFETY STANDARD FOR NUCLEAR POWER SOURCES IN OUTER SPACE (VIENNA, 20-22 FEBRUARY 2006)

Session 4. PRESENTATIONS PERTINENT TO OBJECTIVE I.A. (CONTINUED)

Presentation on "Perspective on the Minimum Essential Elements of a Safety Framework"

Note by the Secretariat

1. In accordance with paragraph 16 of General Assembly resolution 60/99 of 8 December 2005, the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space will organize, jointly with the International Atomic Energy Agency, a technical workshop on the objectives, scope and general attributes of a potential technical safety standard for nuclear power sources in outer space, to be held in Vienna from 20 to 22 February 2006.

2. The presentation contained in the present conference room paper was prepared for the joint technical workshop in accordance with the indicative schedule of work for the workshop, as agreed by the Working Group on the Use of Nuclear Power Sources in Outer Space during the intersessional meeting held in Vienna from 13 to 15 June 2005 (A/AC.105/L.260).

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Perspective on the Minimum Essential Elements of a Safety Framework

John E. Kelly
Sandia National Laboratories
Albuquerque, NM

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1

Presentation Outline

1. **Objective and Main Elements**
2. **Management Aspects**
3. **Technical Aspects**
   - **Design and Testing**
   - **Launch and Mission**
   - **Retirement**
4. **Summary**

Safety Framework Objective

Establish processes and practices that can be implemented during the design, launch, operation and other relevant phases to promote the safe use of Space Nuclear Power Sources.

Framework should include processes and practices on:

- Preventing accidents that involve Space Nuclear Power Sources
- Mitigating radiological consequences if accidents occur
- Being prepared to respond in the event of an accident

Framework Guidelines Should Consider Two Main Elements

1. Management aspects
   - Organization
   - Roles and Responsibilities

2. Technical Aspects
   - Design & Testing
   - SNPS Use

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Basic Safety Management Responsibilities

- Ensure a strong safety culture
- Establish launch approval process
  - Policy and procedures
  - Ensure process adequately assesses safety
- Assign clear scope and division of responsibilities

Examples of Management Actions that Promote Safety

- **Explicitly address known safety issues**
- **Analyze the safety of SNPS use**
- **Independently review the safety analysis**
- **Ensure quality of design, analysis, and hardware**
- **Ensure that resources are adequate to meet safety requirements**
- **Establish accident management plans**

Presentation Outline

1. Objective and Main Elements
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Design and Testing Process Considerations

- Address postulated accidents
- Eliminate and/or mitigate threats through design process that considers, for example,
  - Inherent safety features
  - Redundancy of barriers
  - Diversity of safety systems
- Test and analyze to confirm design

Example Design Guidelines for Launch and Mission Phases

- **Space Nuclear Power Systems should be designed to withstand the normal launch and ascent environments without compromising safety functions**
- **Safety analyses should consider launch, ascent, and reentry accidents and associated accident environments**
- **Credible accidents with large potential radiological consequences should be given particular attention**

Safety of SNPS during Launch and Mission Phases

- For RPSs, safety is largely addressed in the design phase
  - Inherent safety features
  - Robust materials to withstand accidents
  - Launch system design
- For reactors, in addition to design, operational control will impact safety
  - Design to avoid inadvertent sustained criticality
  - Low radioactivity at launch
  - Begin operation in stable configuration

Retirement Guidelines

- **Plan for Safe Retirement**
  - **Consider a range of retirement options**
    - **For example, the selected option could depend on the results of scientific discovery**
- **Design in capabilities for safe retirement**

Summary

- **Management guidance**
  - **Assign safety responsibilities**
  - **Establish requirements for safety policies and practices (analysis, independent review, quality assurance, etc.)**
- **Technical safety guidance**
  - **Design and Testing (e.g., inherent features, redundancy)**
  - **Launch and mission**
    - **RPSs (robust materials)**
    - **Reactors (launch cold, start when stable, avoid inadvertent criticality)**
  - **Retirement**
    - **Plan during the design**